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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/646,409	08/22/2003	Robert A. Bellman	SP03-108	9237

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EXAMINER	
ROSASCO, STEPHEN D	
ART UNIT	**PAPER NUMBER**
1756	

DATE MAILED: 08/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/646,409	BELLMAN, ROBERT A.	
	Examiner	Art Unit	
	Stephen Rosasco	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date ~~11/25/03~~. 12/08/03.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Detailed Action

Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The last lines o f claim 1 recite (v) separating the pellicle layer and a portion of the intermediate layer from the substrate at a location within the intermediate layer...

The use of the term within the intermediate layer is unclear as the removal is not just the intermediate layer and the location is not completely within the intermediate layer.

The specification on page 3, line 5, refers to the Ikuta et al. patent 5,475,575 which is incorrect. The correct number is 6,475, 575, which is listed on the IDS.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikuta et al. (6,475,575) or Eynon (6,524,754) or Smith (6,811,936) in view of Shu (6,842,228).

The claimed invention is to a process for making thin hard pellicle for photomasks used in projection photolithography. The process can be used for making thin hard pellicles comprising a pellicle layer having a thickness in the range of about 5 to 120 mum and a

mount frame attached to the peripheral area of a surface of the pellicle layer. The pellicle layer can consist essentially of a material selected from silica, fluorine doped silica, aluminum doped silica, methylated silica, fluorinated and methylated silica, fluorinated aluminum doped silica, CaFsub2, MgFsub2, BaFsub2 and SiC.

The mount frame is preferred to have substantially the same CTE of the pellicle layer to minimize stress caused by temperature change. The mount frame is preferred to be porous to the purging gas. The process for making the hard pellicle involves deposition of an intermediate layer comprising a hydrogenated amorphous silicon layer on a flat substrate, deposition of the pellicle layer on the intermediate layer, mounting the frame to the pellicle layer and the separation of the pellicle from the substrate by heat treatment.

The applicant discusses the limitations of the prior art to Ikuta et al., which discloses a hard pellicle having a synthetic quartz pellicle layer and a method for making such pellicle. The pellicle layer is required to have less than 100 ppm of OH concentration and to be substantially free of oxygen deficient defect. The specification to meet the requirement of transmission and wavefront distortion with respect to thickness uniformity and sag are difficult to meet. Also, the method disclosed in Ikuta et al. involves forming a discrete sheet of pellicle layer by, for example, thinning and polishing of a fused silica body, followed by cutting and mounting of the pellicle layer to a pellicle mount frame. Making a complete pellicle comprising a thin pellicle layer having a thickness lower than 120 mum mounted to a frame is not practical using the method of Ikuta et al.

And the option of not using a pellicle is not acceptable in most cases, as the reticles used in many processes are very costly to maintain without the protection of a pellicle.

The drawbacks of the above thick hard pellicles can be addressed by a thinner hard pellicle with sufficient structural stability. Since optical aberrations scale directly with the pellicle layer thickness, specification constraints will be two orders of magnitude tighter for an 800 mum hard pellicle compared with an 8 mum hard pellicle.

The applicant also states that where the amorphous silicon layer is fluorine doped, or where a separate fluorine doped layer is deposited adjacent to the silicon layer, as described supra, such laser heating can cause the reactions such as between H and F in the same or adjacent layers, forming gases that causes defects in the intermediate layer, which enables the splitting of the pellicle layer and a portion of the intermediate layer from the substrate 101. The pellicle fabrication process of the present invention takes advantage of the splitting-capable property upon heating of the intermediate layer. By proper heat treatment, the deposited pellicle layer splits from the surface of the substrate with a portion of the intermediate layer. As a result, a pellicle layer 105 bonded to a mounting frame 107 on its second surface is generated. The pellicle layer thus separated from the substrate has a thin layer on its first surface split from the intermediate layer (103 in FIG. 1; 103 and 104 in FIG. 2). In this way, the process of the present invention avoids mounting the pellicle frame to a discrete thin film directly and the possibility of fracture associated with such direct mounting. The substrate 101 may be recycled for making the next pellicle upon separation. Surface finishing by chemical mechanical polishing may be used before it is being used again.

However, the production of a thin hard pellicle less than 120 mum is not without difficulty. The production of the pellicle thin layer and mounting thereof to a frame both constitute great challenges in the prior art. Therefore, there remains a genuine need for a

process of making thin hard pellicles with a thickness of less than about 120 nm having good transmission and laser durability at 157 nm and shorter wavelength.

Ikuta et al. teach a pellicle which comprises a pellicle frame and a pellicle sheet made of a synthetic quartz glass, attached to an opening of the pellicle frame, wherein the pellicle sheet is made of a synthetic quartz glass having a OH group concentration of at most 100 ppm and containing substantially no oxygen deficient defect.

Eynon teaches a photomask used in semiconductor fabrication, said photomask comprising: (a) a substantially planar substrate having an upper and a lower surface, (b) a patterned area of masking material affixed to said upper surface of said substrate, said masking material having a maximum height hsub1 above said substrate, (c) a frame affixed to said upper surface of said substrate and surrounding substantially all of said patterned area of masking material, (d) a silica pellicle having an upper and lower surface secured to said frame and covering substantially all of said patterned area of masking material, wherein said frame includes a receptive area of height hsub2 substantially parallel to said upper surface of said substrate for receiving the lower surface of the outer edges of said pellicle, wherein the height of said receptive area hsub2 is greater than the height of masking material h.sub.1, and (e) means for securing said pellicle to said frame.

And wherein said silica pellicle is secured to said receptive area of said frame using an adhesive.

And wherein said silica pellicle is secured to said receptive area of said frame using a reusable adhesive.

Smith et al. teach a process for fabricating a pellicle membrane structure, comprising: depositing an etch mask layer on a backside of a semiconductor wafer;

depositing a first layer of pellicle membrane protection material that includes carbon on a frontside of the semiconductor wafer; depositing a layer of membrane material on the first layer of pellicle membrane protection material; depositing a second layer of pellicle membrane protection material that includes carbon on the layer of membrane material; patterning the etch mask layer to form an opening within at least one area of the semiconductor wafer; etching the semiconductor wafer to remove semiconductor material in the opening up to an exposed portion of the first layer of pellicle membrane protection material; and exposing a structure comprising the patterned etch mask layer, the etched semiconductor wafer, the first layer of pellicle membrane protection material, the layer of membrane material, and the second layer of pellicle membrane protection material to an oxygen plasma until the carbon in the second layer of pellicle membrane protection material and the exposed portion of the first layer of pellicle membrane protection material is removed from the structure.

And wherein the pellicle membrane protection material is one of SiCN and SiOC.

And further comprising: depositing a handling layer on the second layer of pellicle membrane protection material; and removing the handling layer.

The teachings of Ikuta et al. or Eynon or Smith differ from those of the applicant in that the applicant teaches separating the pellicle with heat from a substrate.

Shu teach a method, comprising: fusing a pellicle to a frame at a first seam between the pellicle and the frame; and attaching the frame to a reticle.

And wherein: said attaching the frame comprises fusing the frame to the reticle.

And wherein fusing the pellicle to the frame comprises: heating a first portion of the pellicle and a second portion of the frame to cause the first and second portions to melt and

fuse together; and cooling the melted first and second portions to form a combined solidified third portion that includes material from both the first and second portions.

And wherein the third portion contains substantially no material that was not in the first portion of the pellicle and the second portion of the frame.

It would have been obvious to one having ordinary skill in the art to take the teachings of Ikuta et al. or Eynon or Smith and combine them with the teachings of Shu in order to make the claimed invention because heating is typically used in the mask and semiconductor arts to separate layers.

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. Rosasco
Primary Examiner
Art Unit 1756

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08/05/05